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(71) Applicant: MINNESOTA MINING AND MANUFACTURING COMPANY [US/US]; 3M Center, P.O. Box 33427, Saint Paul, MN 55133–3427 (US).

(72) Inventors: PEISERT, Joseph, C.; P.O. Box 33427, Saint Paul, MN 55133–3427 (US). HORNBACK, Loyd, R.; P.O. Box 33427, Saint Paul, MN 55133–3427 (US).

(74) Agents: KNECHT, Harold, C., III et al.; Minnesota Mining and Manufacturing Company, Office of Intellectual Property Counsel, P.O. Box 33427, Saint Paul, MN 55133–3427 (US).

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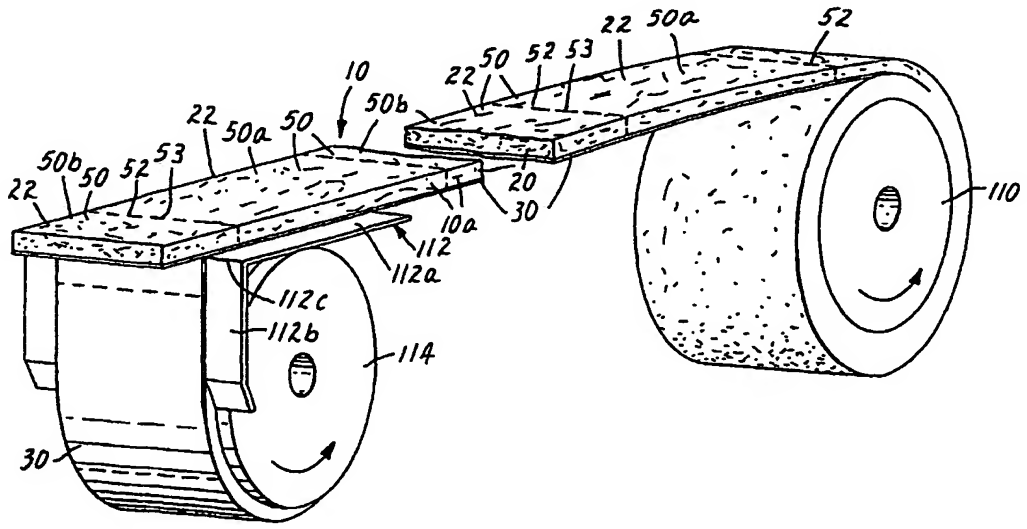

(57) Abstract

Interconnected material elements, such as mounting pads and mats, which may be manufactured and shipped in sheet, strip or roll form. A process is provided for forming the elements, as well as, a process for mounting a pollution control element in a pollution control device.

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MOUNTING MATERIAL FOR POLLUTION CONTROL DEVICES

TECHNICAL FIELD

This invention relates to mounting material for pollution control devices and, more particularly, to mounting material mats and pads which are manufactured as interconnected elements.

BACKGROUND ART

Pollution control devices are universally employed on motor vehicles to control atmospheric pollution. Two types of devices are currently in use -- catalytic converters and diesel particulate filters or traps. Catalytic converters contain a catalyst, which is typically coated onto one or two ceramic monoliths. The monolith or monoliths are housed within a metal container.

Ceramic monoliths tend to be fragile and have coefficients of thermal expansion differing markedly from those of the metal containers in which they are housed. Thus, the mounting of the ceramic monolith in the container must provide resistance to mechanical shock due to impact and vibration and to thermal shock due to thermal cycling. In order to avoid damage to the ceramic monolith from mechanical shock, to compensate for the thermal expansion difference between the ceramic monolith and the metal housing, and to prevent gases from passing between the monolith and the housing, a mounting material in the form of a mat is typically provided between the ceramic monolith and the metal housing.

Diesel particulate filters comprise a porous ceramic filter, also referred to as a monolith, mounted within a metal housing. A mounting mat is commonly provided between the monolith and the metal housing.

Mounting mats for ceramic monoliths are typically die cut from sheets of mounting material. The mounting material sheets comprise, for example, one or more layers of ceramic fibers and/or intumescent material. The individual mats, after being die cut, are packaged in boxes. Prior to mounting the monoliths within the metal housings, the individual mats are removed from the boxes and wrapped about the monoliths. The mats

are secured in place such as by staples or a tape overlay. Each monolith/mat assembly is then inserted into a metal housing.

Pads of mounting material have also been used in catalytic converters between outer housing sections and internal spacers. The internal spacers separate two monoliths mounted within the housing. The mounting material pads are die cut from sheets of mounting material. The die cut pads are packaged in boxes, removed prior to assembly of the catalytic converter housings, and then are adhesively bonded in place in the housing.

Applicants have identified a need for an improved process for manufacturing and packaging mounting material elements, e.g., pads and mats, such that a reduction in handling occurs both during the production of the mounting material elements and during the assembly of the pollution control devices.

SUMMARY OF THE INVENTION

This need is met by the present invention wherein mounting material elements, such as pads or mats, are manufactured as interconnected elements. The elements may be manufactured and shipped in strip, sheet or roll form. The interconnected elements allow for ease in handling during packaging and assembly and reduce packaging costs.

In accordance with a first aspect of the present invention, a mounting material laminate is provided comprising an adhesive layer, a release liner and a mounting material layer. The release liner has the adhesive layer releasably adhered thereto. The mounting material layer has the adhesive layer adhered to one side thereof. Two or more portions of the mounting material layer and corresponding portions of the adhesive layer define two or more mounting laminate sections. The two or more sections are separable from one another and from the release liner. Each of the sections is suitable for use in mounting a pollution control element within a pollution control device.

In accordance with a second aspect of the present invention, a process is provided for mounting a pollution control element in a pollution control device. The process comprises the step of providing a mounting material laminate comprising an adhesive layer, a release liner having the adhesive layer releasably adhered thereto, and a mounting material layer having the adhesive layer adhered to one side thereof. Two or more portions of the mounting material layer and corresponding portions of the adhesive layer define two or

more mounting laminate sections. The process further comprises the steps of separating one of the mounting laminate sections from another of the mounting laminate sections and from the release liner; providing a housing; providing a pollution control element; adhering the one mounting laminate section to one of the housing and the pollution control element using the portion of the adhesive layer forming part of the one mounting laminate section; and positioning the pollution control element within the housing.

In accordance with a third aspect of the present invention, a process is provided for forming a mounting material laminate comprising the steps of: providing a release liner, an adhesive layer and a layer of mounting material; joining together the release liner and the mounting material layer via the adhesive layer, wherein two or more portions of the mounting material layer and corresponding portions of the adhesive layer define two or more mounting laminate sections; and forming a line of weakness between adjacent mounting laminate sections. Each of the sections is separable from another of the sections along a line of weakness and from the release liner and each of the sections is suitable for use in mounting a pollution control element within a pollution control device.

In accordance with a fourth aspect of the present invention, a mounting material structure is provided comprising a mounting material layer having two or more portions defining two or more mounting sections. Each of the sections is separable from another of the sections along a line of weakness and suitable for use in mounting a pollution control element within a pollution control device. The mounting material layer can have one side with an adhesive thereon. In addition, the mounting material layer can also have a release material (i.e., a material that the adhesive is readily removable from) on its other side.

In accordance with a fifth aspect of the present invention, a mounting material element (i.e., a mat or pad) is provided comprising a layer of mounting material having opposite sides. An adhesive is located on one side of the layer of mounting material and a release material is located on the other side.

The objectives, features, and advantages of the present invention will become apparent upon consideration of the detailed description and the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a laminate in roll form;

Fig. 2 is a perspective view of a die rule formed in accordance with a first embodiment of the present invention, with a section of the rule removed;

Fig. 3 is a plan view of a portion of a laminate severed into a plurality of separate strips;

Fig. 4 is a plan view of a portion of a laminate severed into a plurality of interconnected strips;

Fig. 5 is an enlarged view of a portion of a die rule formed in accordance with a second embodiment of the present invention, with a section of the rule removed;

Fig. 6 is a view taken along section line 6-6 in Fig. 5;

Fig. 7 is an enlarged view of a portion of a die rule formed in accordance with a third embodiment of the present invention, with a section of the rule removed;

Fig. 8 is a view taken along section line 8-8 in Fig. 7;

Fig. 9 is a plan view of a portion of a mounting material layer separated into a plurality of interconnected mounting sections;

Fig. 10 is an enlarged view of a portion of a die rule formed in accordance with a fourth embodiment of the present invention, with a section of the rule removed;

Fig. 11 is a view taken along section line 11-11 in Fig. 10;

Fig. 12 is an exploded view of a catalytic converter housing; and

Fig. 13 is a plan view of a catalytic converter with its second outer casing section removed.

MODES FOR CARRYING OUT THE INVENTION

Reference is now made to Figs. 1 and 2, wherein a mounting material laminate 10 is illustrated. The laminate 10 comprises a mounting material layer 20, a release liner 30 and a layer of adhesive 40 (shown in Fig. 2 but not in Fig. 1). The adhesive layer 40 is adhered to one side 42 of the mounting material layer 20 and releasably adhered to the release liner 30. Portions 22 of the mounting material layer 20 and corresponding portions of the adhesive layer 40 define a plurality of mounting laminate sections 50. Adjacent sections 50 are separated from one another by lines of weakness 52 and are separable from one another along those lines 52. The sections 50 are also separable from the release liner 30.

The mounting material layer 20 comprises one or more layers of ceramic material and/or intumescent material or any other material(s) suitable for mounting a pollution

control element within a pollution control device. Example mounting materials are set out in U.S. Patent Nos. 3,916,057 and 5,380,580, the disclosures of which are incorporated herein by reference. The present invention is not intended to be limited to any particular type of mounting material layer. The layer 20 may have a thickness T_M of from about .040 inch (1.0 mm) to about 0.6 inch (15.0 mm).

In the illustrated embodiment, the release liner 30 and the adhesive layer 40 are combined to form a tape 32. The tape 32 is applied to the mounting material layer 20 prior to the laminate 10 being cut into strips or sheets. The tape 32 may comprise one which is commercially available from the 3M Corporation under the product designation "High Tack Adhesive Transfer Tape No. 927." The 3M tape includes a release liner comprising a silicone-coated paper substrate and an adhesive layer comprising a layer of an acrylic pressure-sensitive adhesive. The paper substrate has a thickness of about .004 inch and the adhesive layer has a thickness of about .002 inch. The adhesive layer is releasably adhered to the paper substrate. It is also contemplated that the adhesive layer 40 may comprise a film having layers of pressure sensitive adhesive on opposite sides thereof. Other release liners and adhesive layers not explicitly discussed herein may be used in place of the ones described above. Further, the specific thickness of the adhesive layer as well as the thickness of the release liner may vary from the dimensions set out above for the tape used in the illustrated embodiment. It is also contemplated that the tape 32 may have a width which is less than the width of the mounting material layer 20 such that the tape covers only a portion of one side of the layer 20. For example, one or more one inch wide strips of tape 32 may be joined to a mounting material layer 20 having a width of from about 2 inches to about 10 inches. In the illustrated embodiment, the width of the tape 32 is approximately equal to the width of the layer 20.

It is further contemplated that the mounting material layer 20 or individual mounting material elements (i.e., mats or pads) could have an adhesive applied to one side 42 and a release material (e.g., silicone materials,etc.) applied to the other side 44. In this way, a release liner could be eliminated. Such a mounting structure, without a separate release liner, can be rolled-up so the adhesive side contacts the release material side. The rolled mounting material structure can then be unrolled, the desired number of mounting sections removed, and each mounting section used in mounting a pollution control element.

For example, when the mounting sections are mounting mats, each mounting mat can be wrapped around the pollution control element with the adhesive bonding the mounting mat to the pollution control element. The release material side of the wrapped mounting mat would then be exposed. Assuming a low friction release material is used, the resulting wrapped pollution control element can be more easily inserted into the housing of a pollution control device. Instead of being rolled, the mounting structure, without a release liner, can be in strip or sheet form. Multiple strips or sheets can then be stacked one on top of the other so the adhesive side of each strip or sheet contacts the release material side of another strip or sheet, respectively. Alternatively, individual mounting material elements (i.e., mats or pads), with an adhesive on one side and a release material on the other, can be similarly stacked.

It is even further contemplated that the adhesive layer 40, located on one side 42 of the mounting material layer 20, may be a repositionable adhesive such as, for example, a patterned hot melt adhesive, a microsphere adhesive and any other repositionable adhesive known to those of ordinary skill in the art. When a repositionable adhesive is used, a primer is often used for bonding the repositionable adhesive to the desired substrate (here, the mounting material layer 20). If a repositionable adhesive is used, the release liner 30 may be optional. If a release liner is not used, it may be desirable for a release material such as, for example, a low adhesion backsize (LAB) to be applied to the other side 44 of the mounting material layer 20. This mounting material layer 20 can then be rolled-up so that the repositionable adhesive on side 42 is in contact with the release material on the other side 44. The release material can enable the roll of mounting material layer 20 to be unrolled more easily. Sheets or strips of layer 20, or individual mats or pads of the mounting material, can also be stacked one on top of the other so that the repositionable adhesive on side 42 is in contact with the other side 44, with or without the optional release material.

The lines of weakness 52 may comprise lines of at least one perforation, score lines or embossed lines. The term "score line" or "scored portion," as used herein, describes a severed line or portion which extends only part way through the thickness of the material. The term "embossed line" or "embossed portion," as used herein, describes a non-cut creased or folded line or portion in a material which may be formed by a blunt edge (not

shown) of a die rule. It is also contemplated that a line of weakness 52 may have a first portion which is perforated and a second portion which is scored or embossed. Any combination of perforated, scored and embossed portions within a single line of weakness 52 is possible.

In the Fig. 2 embodiment, each line of weakness 52 comprises a line of perforations 53. The perforated lines 53 are formed by a die rule 60. The die rule 60 comprises a notched blade 62 having three spaced-apart teeth 64a-64c and two lateral blades 66. Alternatively, the notched blade 62 may have two or four or more spaced-apart teeth. The lateral blades 66 extend transversely to the notched blade 62. The blades 62 and 66 are mounted in a wooden die board 68 which in turn is mounted to a reciprocating member of a press (not shown). The teeth 64a-64c of the blade 62 cut completely through sections of the mounting material layer 20, the adhesive layer 40 and the release liner 30 so as to form three perforations 53a in the laminate 10. The lateral blades 66 cut completely through the laminate 10 so as to create separation lines 54 in the laminate 10. After extending through the laminate 10, the blades 62 and 66 engage a polymeric sheet (not shown), such as a .25 inch polypropylene sheet, located beneath the laminate 10. Uncut portions of the mounting material layer 20 and the adhesive layer 40 maintain adjacent sections 50 interconnected until they are separated from one another and the release liner 30 during an assembly operation. Uncut portions of the release liner 30 together with the uncut portions of the mounting material layer 20 and the adhesive layer 40 maintain sections 10a of the laminate 10 interconnected so as to maintain the laminate 10 in strip form until the sections 50 are needed. The specific width W of uncut portions 10b of the laminate 10 as well as the number of uncut portions 10b are preferably selected so that the sections 50 remain interconnected until they are required to be separated from one another and the release liner 30.

While not shown in Fig. 2, the die rule 60 may include a plurality of notched blades 62 and three or more lateral blades 66. The blades 62 and 66 sever the laminate 10 into a plurality of separate strips 100 of interconnected sections 50, wherein each section 50 is positioned end to end to at least one other section 50, see Fig. 3. It is also contemplated that a strip 100 may be wrapped about a dispensing roll 110, see Fig. 1, such that the strip 100 is in roll form. It is further contemplated that the die rule 60 may include a plurality of

notched blades 62 and three or more notched lateral blades (not shown). The notched lateral blades create separation lines 540, see Fig. 4, comprising lines of weakness. Hence, the notched blades 62 and the notched lateral blades are capable of severing a laminate 10 into a sheet 102 of interconnected strips 100, wherein each strip 100 includes a plurality of interconnected sections 50. In the Fig. 4 embodiment, each section 50 is positioned side-by-side to at least one other section 50 and end to end to at least one additional section 50. The sheet 102 may be wound onto a dispensing roll 110 such that the sheet 102 is in roll form.

A die rule 160, formed in accordance with a second embodiment of the present invention, is illustrated in Figs. 5 and 6, wherein like reference numerals indicate like elements. In this embodiment, the die rule 160 comprises at least one serrated blade 162 having a plurality of teeth 164 and two or more lateral blades (not shown). The lateral blades are similar in make up to the blades 66 and extend at an angle of about 90 degrees to the serrated blade 162. The serrated and lateral blades are mounted in a wooden die board 68 which in turn is mounted to a reciprocating member of a press (not shown). The teeth 164 in the illustrated embodiment are formed such that they cut almost completely through the mounting material layer 20 and, hence, form a perforated line in the layer 20. The teeth 164 also create a plurality of perforations in the adhesive layer 40 and the release liner 30. The lateral blades cut completely through the laminate 10 so as to create separation lines 54 in the laminate 10. Alternatively, the lateral blades may be notched or serrated. The notched or serrated lateral blades form separation lines of weakness 540 in the laminate 10 so as to form one or more interconnected strips 100. After extending through the laminate 10, the serrated and lateral blades engage a polymeric sheet (not shown), such as a .25 inch polypropylene sheet, located beneath the laminate 10. It is also contemplated that the teeth 164 may be formed so that they cut completely through the mounting material layer 20 while cutting only perforations in the adhesive layer 10 and the release liner 30.

A die rule 260 formed in accordance with a third embodiment of the present invention is illustrated in Figs. 7 and 8, wherein like reference numerals indicate like elements. In this embodiment, the die rule 260 comprises a plurality of first serrated blades 262 and second lateral serrated blades (not shown). The first and second blades form perforation lines 252 in a mounting material layer 200 so as to define a plurality of

mounting sections 270, see Fig. 9. Each section 270 is provided with a tab 272 at one end and a tab-receiving notch 274 at an opposite end. The layer 200 is preferably formed from the same material as the layer 20 discussed above. It is also contemplated that the second lateral blades may be constructed so that they cut completely through the mounting material layer 200 such that the layer 200 is separated into separate strips of mounting sections 270.

A die rule 360 formed in accordance with a fourth embodiment of the present invention is illustrated in Figs. 10 and 11, wherein like reference numerals indicate like elements. In this embodiment, the die rule 360 comprises a plurality of first blades 362 and second lateral blades (not shown). Each of the first and second blades has a generally linear cutting edge 362a for forming score lines 351 in a mounting material layer 300. The score lines 351 define a plurality of mounting sections 370 which are shaped in the same manner as the mounting sections 270 illustrated in Fig. 9. It is also contemplated that the second lateral blades may be formed so that they cut completely through the mounting material layer 300 such that the layer 300 is separated into separate strips of mounting sections 370.

The mounting laminate sections 50 may comprise mounting material pads 350 and the mounting sections 270 and 370 may comprise mounting material mats 352. The pads 350 and mats 352 are adapted for use in mounting pollution control elements in pollution control devices. The pads 350 are preferably formed from a ceramic material. The mats 352 are preferably formed from one or more layers of a ceramic material and/or an intumescent material.

Referring now to Fig. 12, a housing 300 of a catalytic converter 310 is illustrated. The housing 300 comprises first and second outer casing sections 302 and 304 and first and second internal spacers 306 and 308. The sections 302 and 304 and the spacers 306 and 308 are preferably formed from a metal, such as stainless steel. Positioned between the first casing section 302 and the first spacer 306 are first, second and third mounting material pads 350a-350c. Positioned between the second casing section 304 and the second spacer 308 are fourth, fifth and sixth mounting material pads 350d-350f. The pads 350a-350f aid in maintaining energy in the form of heat within the catalytic converter housing 300. The spacers 306 and 308 are weldably or otherwise connected to the outer casing sections 302 and 304.

The catalytic converter 310 further includes two conventional ceramic monoliths 330 and 332, see Fig. 11. In Fig. 11, the second casing section 304 is not shown. Each of the monoliths 330 and 332 is wrapped in a mounting material mat 352. Each mat 352 includes a tab 372 at a one end which is received within a notch 374 located at an opposite end of the mat 352. The mats 352 serve to tightly but resiliently support the monoliths 330 and 332 within the joined casing sections 302 and 304 by expansion in situ of the mounting material.

The catalytic converter 310 is assembled as follows. Sections 50a illustrated in Fig. 1 may comprise the pads 350b and 350e while the sections 50b may comprise the pads 350a, 350c, 350d and 350f. The pads 350a-350f are removed from the release liner 30 and adhesively secured to the spacers 306 and 308. As is illustrated in Fig. 1, the release liner 30 preferably passes over a plate 112 having first and second generally planar portions 112a and 112b which extend generally transversely to one another. A sharp edge 112c is defined where the planar portions 112a and 112b meet. The release liner 35 follows along the outer surface of the plate 112 and is wound onto a take-up roll 114. Because the release liner 30 passes over the sharp edge 112c, it more readily separates from the laminate sections 50, thereby allowing an operator to easily remove a section 50 from the release liner 30.

The spacers 306 and 308, having the pads 350a-350f adhered thereto, are weldably or otherwise secured to the casing sections 302 and 304. The mats 352 are separated from one another along perforation lines 252 or score lines 351. They are then wrapped about the monoliths 330 and 332 and secured in position such as by staples or a tape overlay. The wrapped monoliths 330 and 332 are then inserted into the first casing section 302. Thereafter, the second casing section 304 is assembled to the first section 302 and welded or otherwise coupled to the first section 304.

It is also contemplated that the mats 352 may be formed from a laminate 10 such that they include a layer of adhesive which allows the mats 352 to be adhered directly to the monoliths 330 and 332. Further, the pads 350 may be formed without an adhesive layer.

It is further contemplated that a first end of the release liner 30 of each laminate strip 100 may extend out beyond the mounting material layer 20 so as to define a tab (not

shown) to allow an operator to easily separate the release liner from the first laminate section 50 on the strip 100.

It is additionally contemplated that a line of weakness may be formed by a die rule passing first through the release liner 30 and the adhesive layer 40 before passing through the mounting material layer 20. Hence, a line of weakness may be formed by cutting completely through the release liner 30 and the adhesive layer 40 and only partially through the mounting material layer 20 such that a perforated or score line is formed in the mounting material layer 20.

It is still further contemplated that the mats 352 may be used to encase other pollution control elements such as monoliths used in diesel particulate filters or between metal layers of a double-walled end cone which end cone may be used in a catalytic converter. When used in an end-cone application, the mat 352 is used for insulation and not mounting purposes. Therefore, the present invention may also be applicable to providing such material layers for any use in a pollution control device (e.g., for insulating).

What is claimed is:

1. A laminate comprising:
an adhesive layer;
a release liner having said adhesive layer releasably adhered thereto; and
a material layer having said adhesive layer adhered to one side thereof, two or more portions of said material layer and corresponding portions of said adhesive layer defining two or more laminate sections, said two or more sections being separable from one another and from said release liner, each of said sections being suitable for use within a pollution control device.

2. A material laminate as set forth in claim 1, wherein said laminate is in strip form with said two or more sections positioned end-to-end to one another.

3. A material laminate as set forth in claim 1, wherein said laminate is in sheet form where said two or more sections are at least positioned side-by-side to one another.

4. A material laminate as set forth in claim 1, wherein said laminate is in roll form.

5. A material laminate as set forth in claim 1, wherein adjacent ones of said two or more laminate sections are readily separable from one another along a line of weakness.

6. A material laminate as set forth in claim 5, wherein said line of weakness comprises a line of at least one perforation formed through at least said material layer.

7. A material laminate as set forth in claim 1, wherein adjacent ones of the portions of said material layer are readily separable from one another along a line of one or more perforations.

8. A material laminate as set forth in claim 7, wherein adjacent ones of the portions of said adhesive layer are readily separable from one another along a line of one or more perforations.

9. A material laminate as set forth in claim 1, wherein adjacent portions of said release liner corresponding to said laminate sections are partially disconnected from one another by a line of weakness.

10. A material laminate as set forth in claim 1, wherein each of said laminate sections is in the form of a mounting pad adapted to be positioned between an outer casing section and a spacer element of a pollution control device.

11. A material laminate as set forth in claim 1, wherein each of said laminate sections is in the form of a mounting mat adapted to be wrapped around a pollution control element.

12. A process for mounting a pollution control element in a pollution control device comprising the steps of:

providing a material laminate comprising an adhesive layer, a release liner having said adhesive layer releasably adhered thereto, and a material layer having said adhesive layer adhered to one side thereof, two or more portions of said material layer and corresponding portions of said adhesive layer defining two or more laminate sections;

separating one of said laminate sections from another of said laminate sections and from said release liner;

providing a housing;

providing a pollution control element;

adhering said one laminate section to one of said housing and said pollution control element using the portion of said adhesive layer forming part of said one laminate section; and

positioning said pollution control element within said housing.

13. A process as set forth in claim 12, wherein said pollution control element comprises a monolith.

14. A process as set forth in claim 12, wherein said step of providing a housing comprises the step of providing first and second outer casing sections and at least one spacer and said adhering step comprises adhering said one laminate section to one of said first and second outer casing sections and said spacer.

15. A process as set forth in claim 12, wherein said one laminate section comprises a mounting mat adapted to be wrapped around said pollution control element.

16. A process for forming a material laminate comprising the steps of:

providing a release liner, an adhesive layer and a layer of material;

joining together said release liner and said material layer via said adhesive layer, wherein two or more portions of said material layer and corresponding portions of said adhesive layer define two or more laminate sections; and

forming a line of weakness between adjacent laminate sections, each of said sections being separable from another of said sections along a line of weakness and from said release liner and each of said sections being suitable for use in mounting a pollution control element or insulating within a pollution control device.

17. A process as set forth in claim 16, wherein each of said laminate sections is in the form of a mounting pad adapted to be positioned between an outer casing section and a spacer element of the pollution control device.

18. A process as set forth in claim 16, wherein each of said laminate sections is in the form of a mounting mat adapted to be wrapped around the pollution control element.

19. A material structure comprising a material layer having two or more portions defining two or more sections, each of said sections being separable from another of said sections along a line of weakness and suitable for use in mounting a pollution control element or for insulating within a pollution control device.

20. A material structure as set forth in claim 19, wherein said material structure is in strip form with said two or more sections positioned end-to-end to one another.

21. A material structure as set forth in claim 19, wherein said material structure is in sheet form where said two or more sections are at least positioned side-by-side to one another.

22. A material structure as set forth in claim 19, wherein said material structure is in roll form.

23. A material structure as set forth in claim 19, wherein said line of weakness comprises a line of at least one perforation.

24. A material structure as set forth in claim 19, wherein said line of weakness comprises a score line.

25. A material structure as set forth in claim 19, wherein said material layer comprises intumescent material.

26. A material structure as set forth in claim 19, wherein each of said sections is in the form of a mounting pad adapted to be positioned between an outer casing section and a spacer element of a pollution control device.

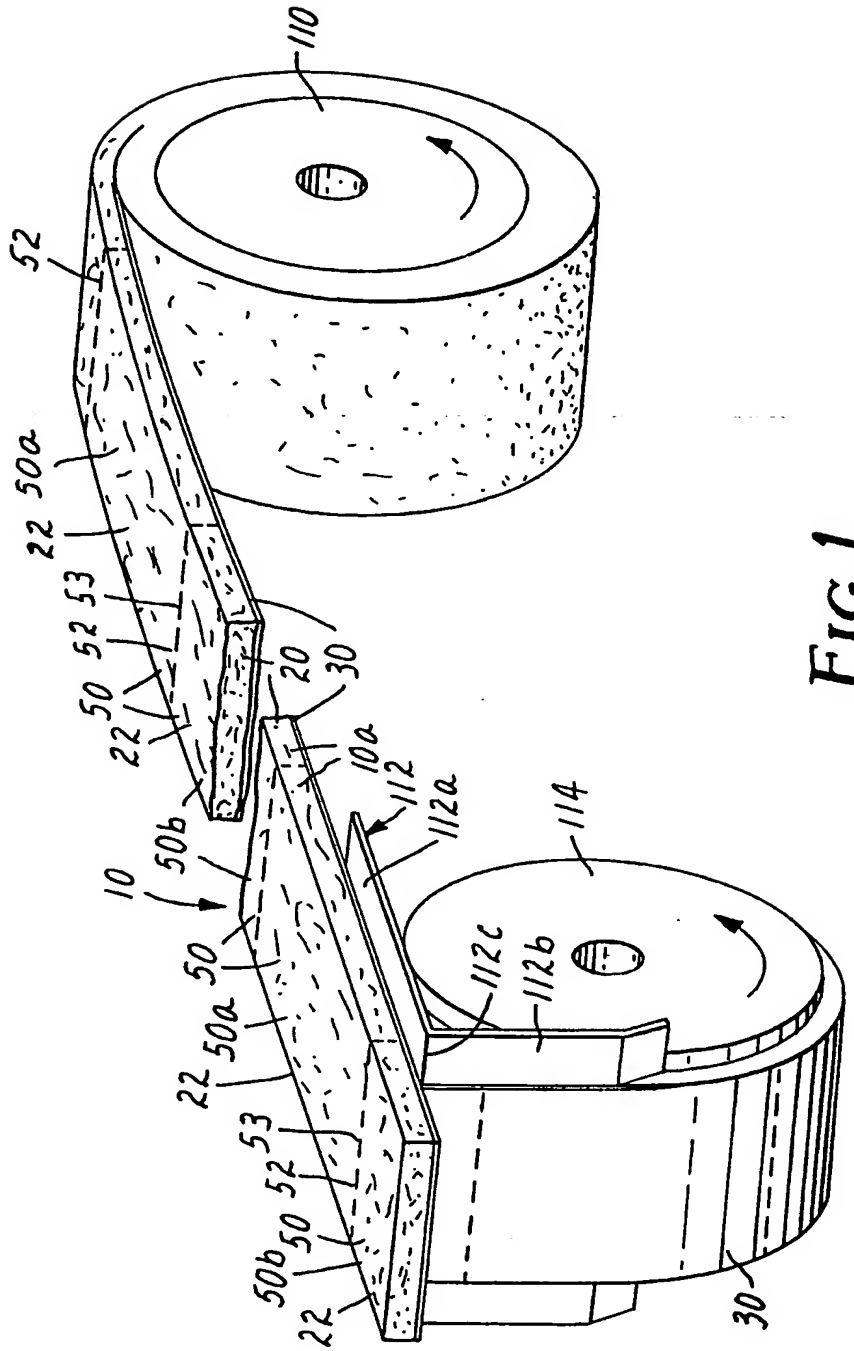
27. A material structure as set forth in claim 19, wherein each of said sections is in the form of a mounting mat adapted to be wrapped around a pollution control element.

28. A material structure as set forth in claim 19, wherein said material layer has one side with an adhesive thereon.

29. A material structure as set forth in claim 28, wherein said material layer has another side with a release material thereon.

30. A material element comprising a layer of material having opposite sides, with an adhesive on one side and a release material on the other side, and said material being suitable for use in a pollution control element or insulating within a pollution control device.

31. A material structure comprising a plurality of material elements separable from one another, each element comprising a layer of material having opposite sides, with a repositionable adhesive on one side, and said material being suitable for use in a pollution control element or insulating within a pollution control device.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50a
22
53
52
50
22
20
30
10a
112
112a
114
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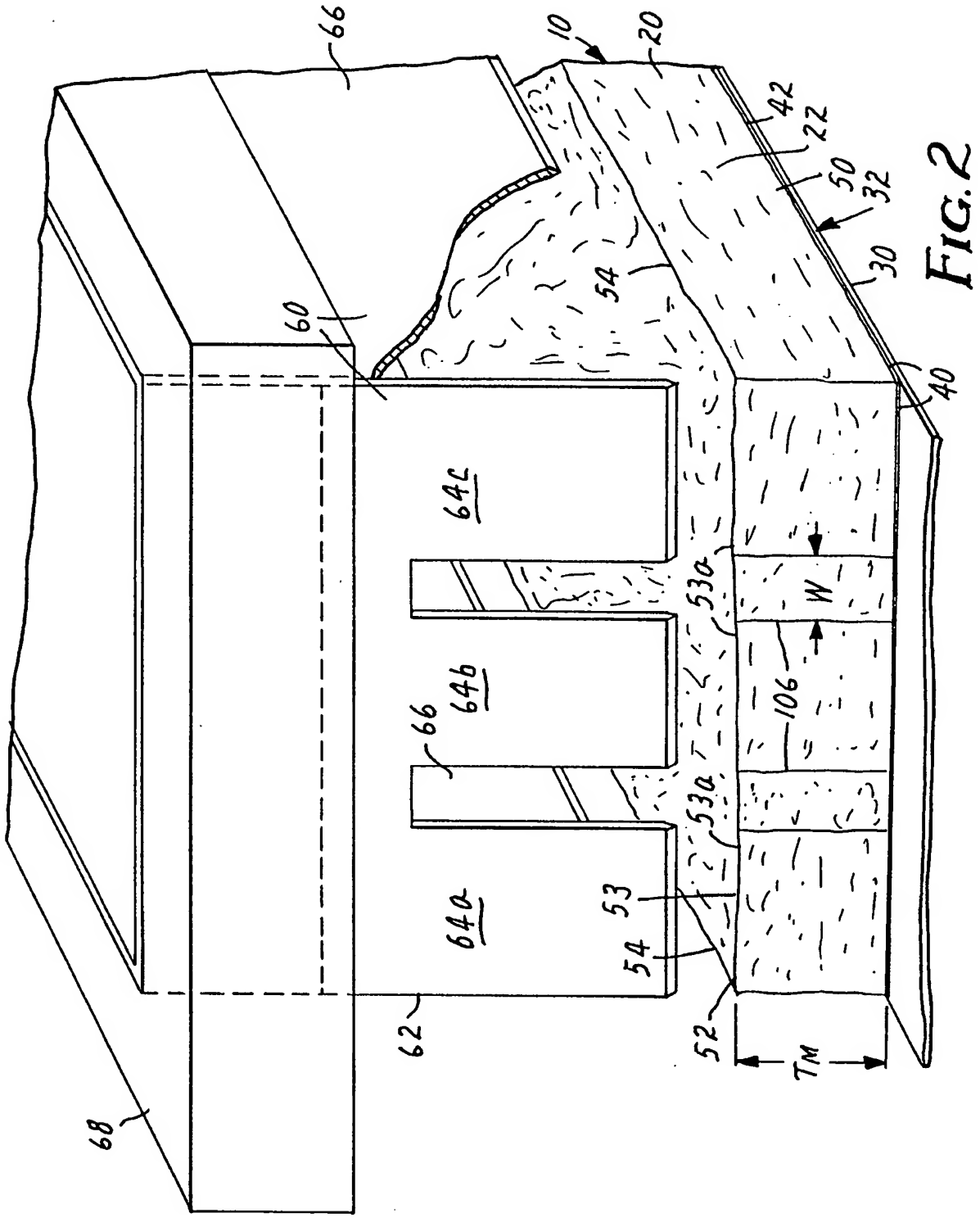
50b
50
112c
112b
50
50a
22
53
52
50
50b
22
30

FIG. 1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32
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W
64b
66
106
53a
64a
53
54
52
TM
62
68

FIG. 2

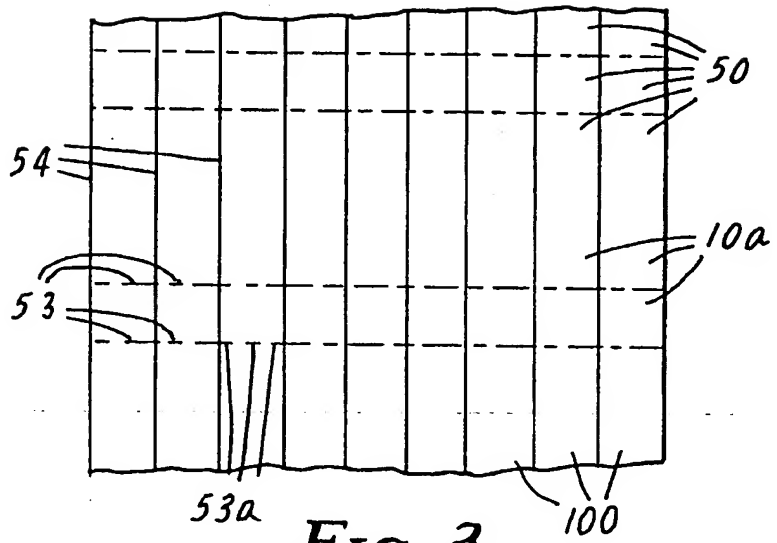


FIG. 3

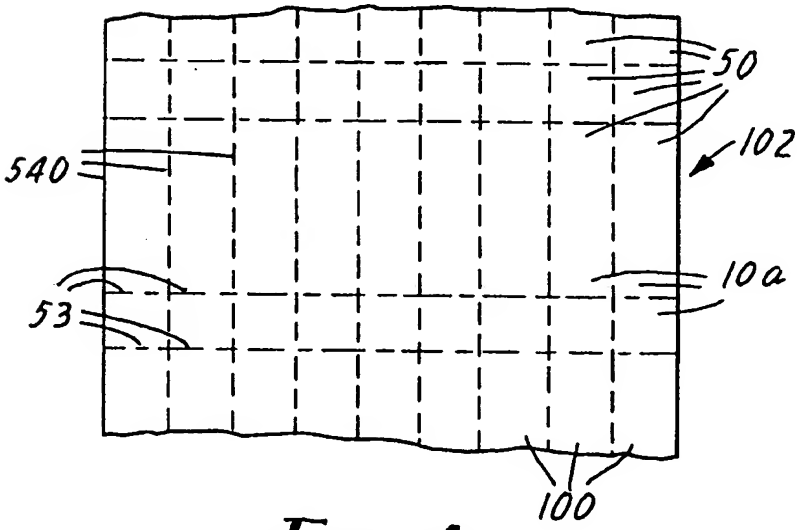


FIG. 4

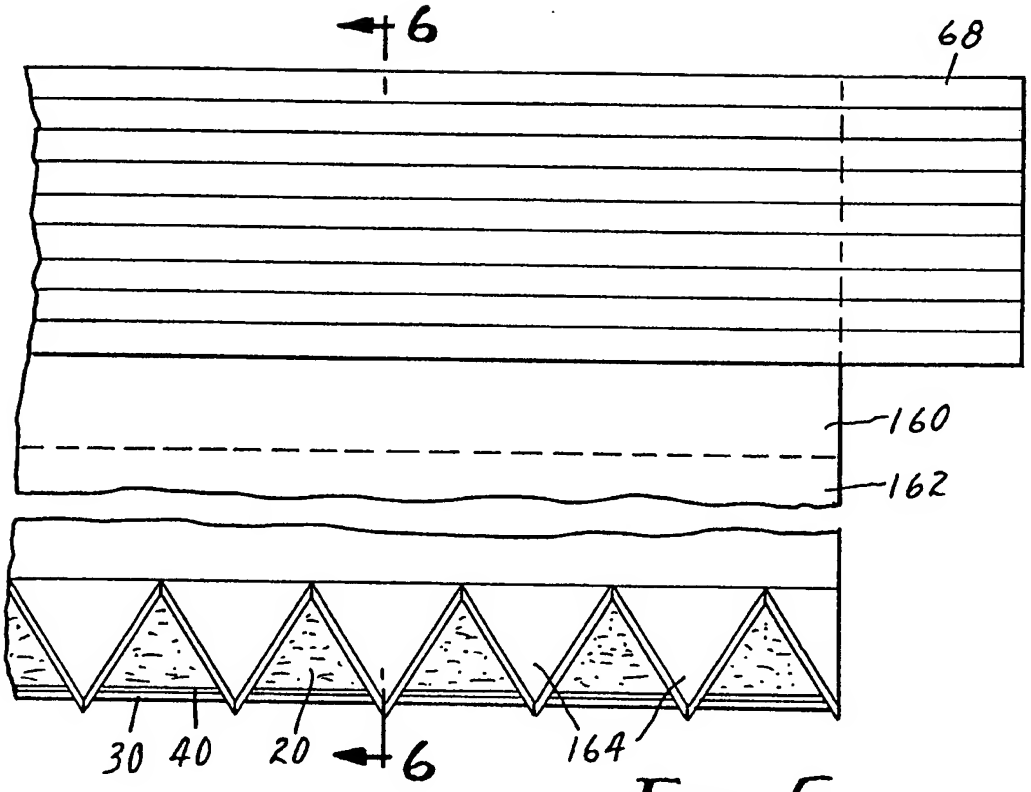


FIG. 5

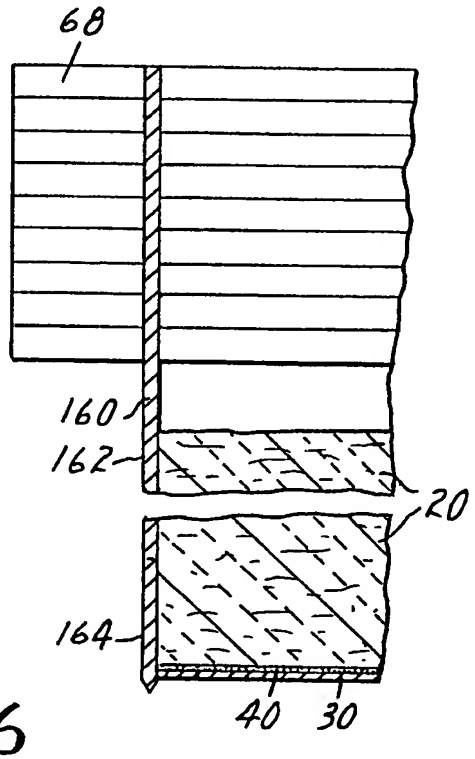


FIG. 6

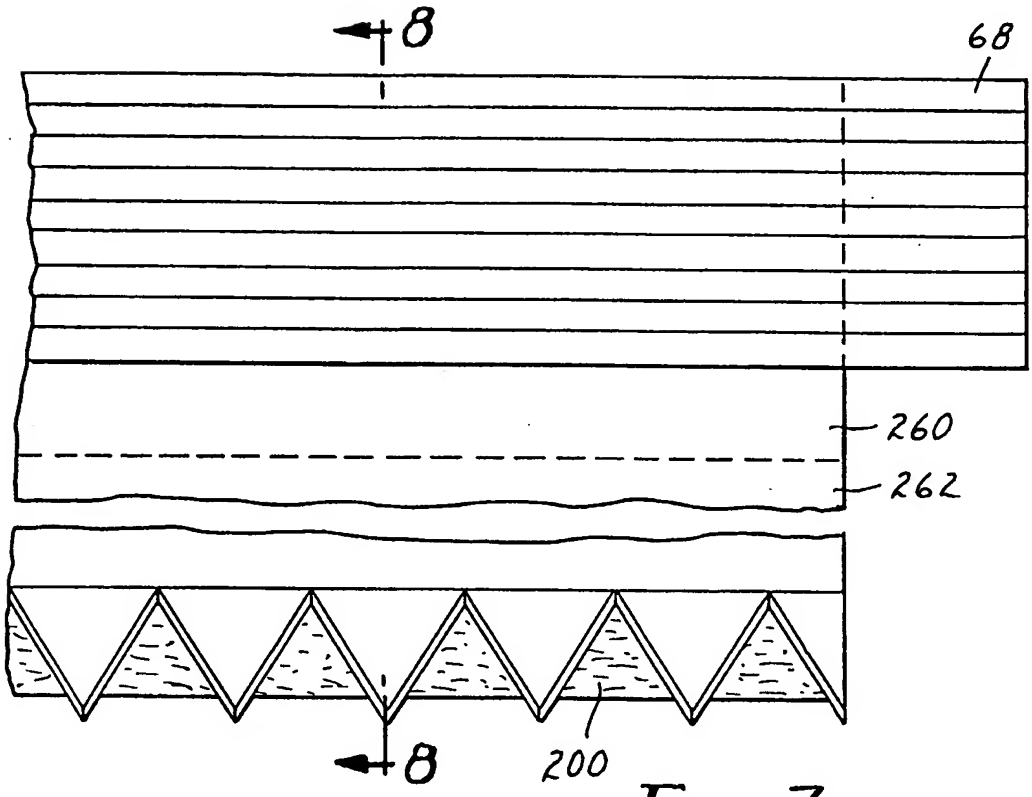


FIG. 7

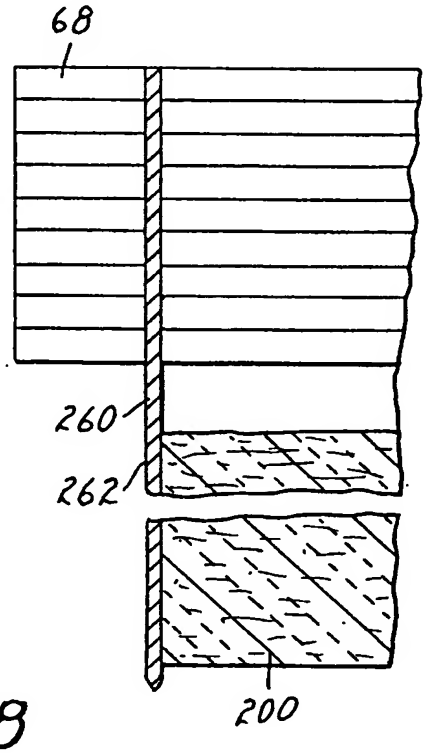
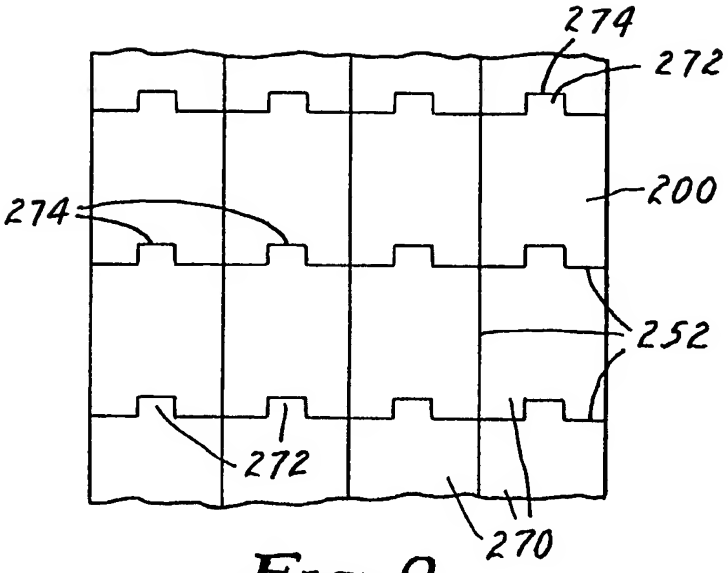


FIG. 8


274
272
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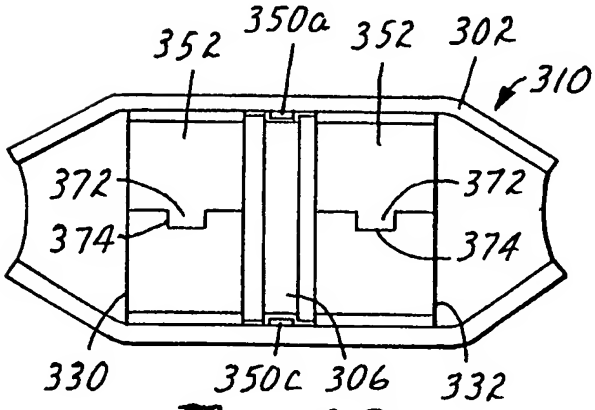
252
272
270

FIG. 9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350a
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330
350c
306
332

FIG. 13

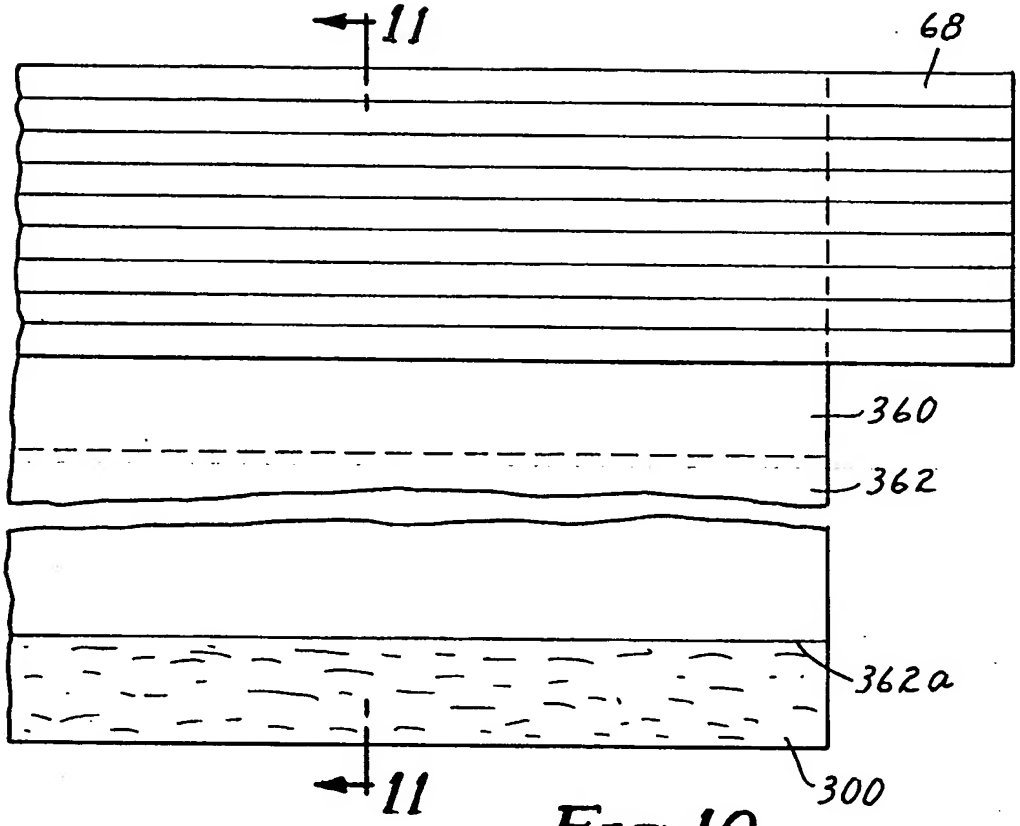

FIG. 10

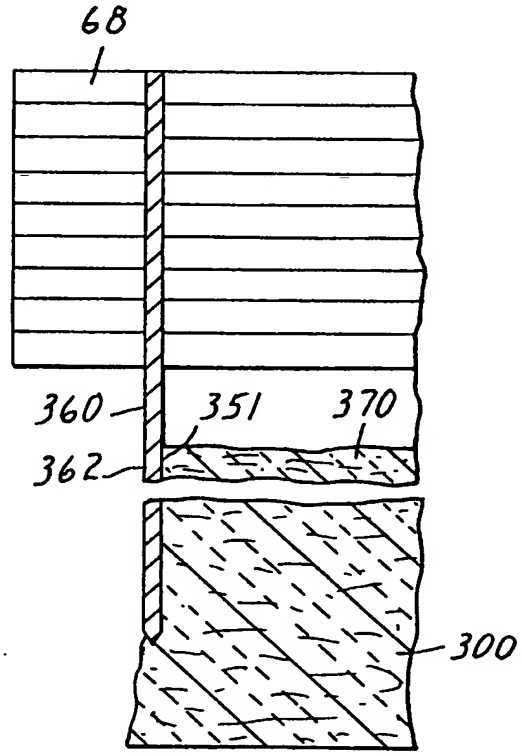

FIG. 11

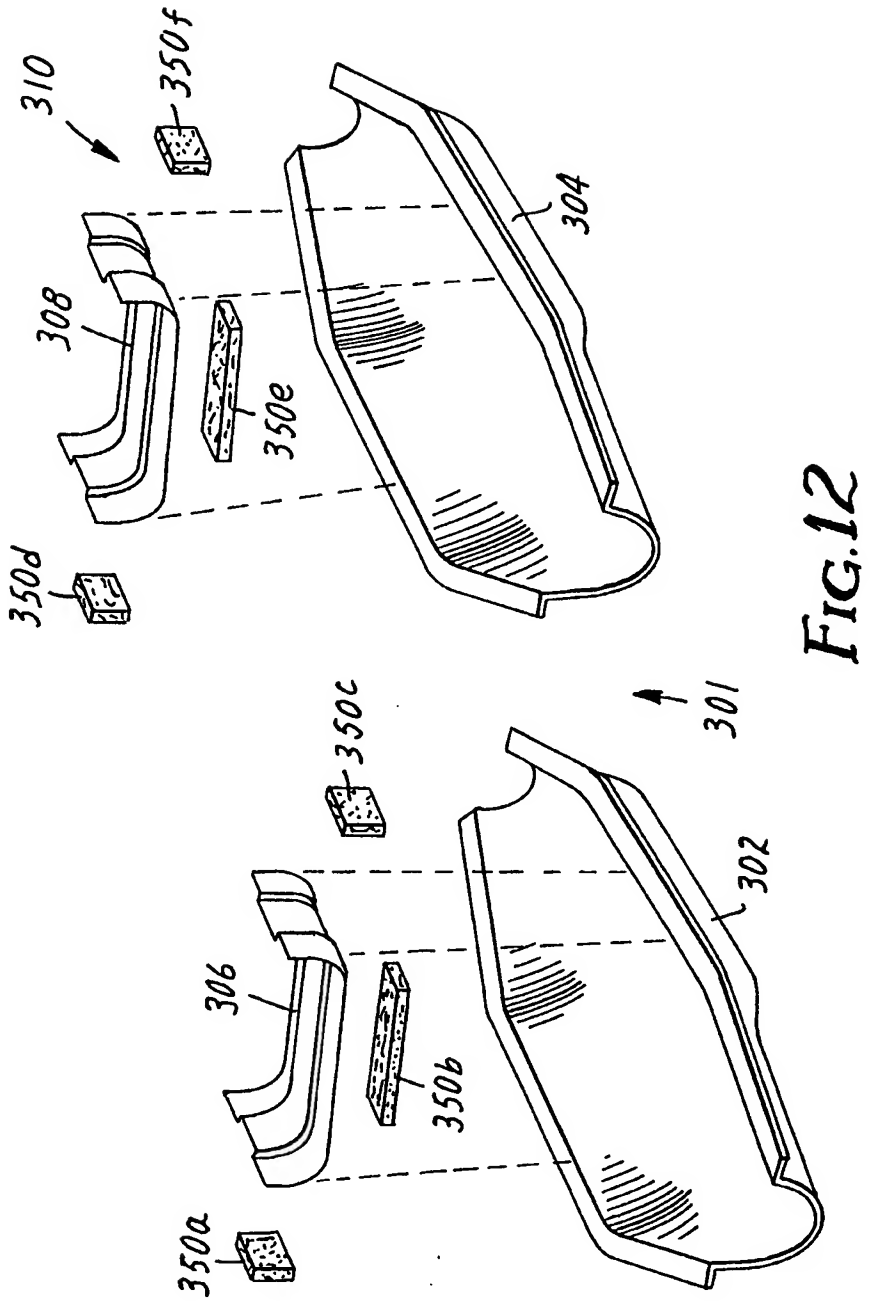

FIG.12

INTERNATIONAL SEARCH REPORT

Interi ıal Application No
PCT/US 99/01929

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C09J7/02 F01N3/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 C09J F01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 92 03264 A (FORBO CP LTD) 5 March 1992 see abstract see figure 1 ---	1,3-5, 16,19, 21,22, 24,28
X	WO 89 09129 A (SALACUSE FRANK S ;MARKUS FRANKLYN M (CA)) 5 October 1989 see abstract see page 3, paragraph 2 see page 6, paragraph 1 see figures 1-3 ---	1,2,4,5, 19,20, 22,24,28
A	US 4 048 363 A (LANGER ROGER L ET AL) 13 September 1977 see the whole document --- -/--	1-31

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 April 1999	07/05/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Schlicke, B

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INTERNATIONAL SEARCH REPORT

Inter. nal Application No
PCT/US 99/01929

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 548 395 A (NITTO DENKO CORP) 30 June 1993 see abstract see column 2, line 15 - line 30 see column 3, line 25 - line 27 see column 3, line 37 - line 39 see figures 1-3 -----	19,20, 22,24, 28-30

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INTERNATIONAL SEARCH REPORT

information on patent family members

Inter nal Application No
PCT/US 99/01929

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		EP 0543863 A	02-06-1993
		ES 2065699 T	16-02-1995
WO 8909129 A	05-10-1989	AU 3537389 A	16-10-1989
US 4048363 A	13-09-1977	NONE	
EP 0548395 A	30-06-1993	DE 69118703 D	15-05-1996
		DE 69118703 T	29-08-1996